Practitioner's Docket No. U 013492-2 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Klony LIEBERMAN, et al. Group No.:
Serial No.: 09/866,859
Filed: May 29, 2001 Examiner:
For: VIRTUAL DATA ENTRY DEVICE AND METHOD FOR INPUT OF ALPHANUMERIC AND OTHER DATA

Assistant Commissioner for Patents
Washington, D.C. 20231

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Attached please find the certified copy of the foreign application from which priority is claimed for this case:

Country: Israel

Application Number: 136432

Filing Date: May 29, 2000

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I hereby certify that this correspondence is, on the date shown below, being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

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Date: August 8, 2001

Julian H. Cohen
(type or print name of person certifying)

8/8/01 JHC

SIGNATURE OF PRACTITIONER

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לשכת הפטנטים

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חוק הפטנטים, התשכ"ז -- 1967
PATENTS LAW, 5727-1967

בקשה לפטנט
Application for Patent

C:38068

לשימוש הלשכה
For Office Use

מספר: Number	136432
תאריך: Date	29-05-2000
הוקדם/נדחה Ante/Post-dates	

אני, (שם המבקש, מענו -- ולגבי גוף מאוגד -- מקום התאגדותו)
I (Name and address of applicant, and, in case of body corporate-place of incorporation)

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Inventor: Boaz Arnon
(An Israeli Citizen)

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התקן לקליטת נתונים

(באנגלית)
(English)

DATA INPUT DEVICE

מבקש בזאת כי ינתן לי עליה פטנט
hereby apply for a patent to be granted to me in respect thereof

*בקשה חלוקה - Application for Division	*בקשת פטנט מוסף - Application for Patent of Addition	*דרישה דין קדימה Priority Claim		
		מספר.סימן Number/Mark	תאריך Date	מדינת האיגוד Convention Country
מבקשת פטנט from Application No._____.מס dated_____יום	*לבקשה/לפטנט to Patent/Appl. No._____.מס dated_____מיום			
רצוף בזה / עוד יוגש–*יפוי כח: כללי/מיוחד P.O.A.: general / individual - attached / to be filed later - filed in case_____הוגש בענין				
המען למסירת הודעות ומסמכים בישראל Address for Service in Israel Sanford T. Colb & Co. P.O.B. 2273 Rehovot 76122				
חתימת המבקש Signature of Applicant For the Applicant, Sanford T. Colb & Co. C:38068	היום 29 בחודש May שנת 2000 This of the year			

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* מחק את המיותר Delete whatever is inapplicable

התקן לקליטת נתונים

DATA INPUT DEVICE

וי. קיי. בי. בע"מ

VKB LTD.
C: 38068

DATA INPUT DEVICE

FIELD OF THE INVENTION

The present invention relates generally to data input devices, such as keyboards, and particularly to optically generated images of data input devices.

BACKGROUND OF THE INVENTION

Data input devices, such as keyboards, touch pads, calculator pads, telephone keypads, and the like, are well known devices with alphanumeric keys. Other data input devices, such as joysticks, mouses, trackballs and the like, generally do not have keys. Whatever the kind of input device, a user must generally press one or more keys or buttons in order to input data.

Data input devices are generally in wired communication with a computer terminal and the like, for controlling cursor movement, displaying commands, etc. Wireless cursor control systems have also been proposed, such as the system described in US Patent 5,181,181, the disclosure of which is incorporated herein by reference. This system includes a three-dimensional computer apparatus input device that uses three sets of accelerometers and angular rate sensors to determine acceleration, velocity, relative position and attitude of the device.

However, all of the known input devices have several drawbacks. Although tremendous technological advances have been made in computer and telecommunication hardware, nevertheless the data input device still remains a device with a relatively large amount of moving parts and electronics. In addition, mobile communication devices that use input devices such as keyboards, have a particular problem of balancing logistics and space. If a small keyboard is used, then the keys sometimes must be pressed several times just to indicate one character, making the device cumbersome to use. If a larger keyboard is used, then the device becomes too large to carry conveniently.

SUMMARY OF THE INVENTION

The present invention seeks to provide a novel and improved data input device. In the present invention, there is no physical input device, rather an optical image of a data input device is generated. A light beam emanating from a light source (e.g., laser source) is preferably moved by means of a mirror array or scanner, for example, at high speed to form a two-dimensional or three-dimensional image of an input device, such as a keyboard with all of the keys, in which case the user presses the "virtual" keys of the "virtual" optically generated keyboard. Another example of an optically generated input device is a "virtual" mouse, wherein pressing or touching an outlined area performs a "click". Other examples

include "virtual" musical instruments, such as an organ, a "virtual" switch, a "virtual" telephone touch pad, and the like.

Preferably optical, acoustic, position or movement sensors sense the "pressing" or "striking" of the virtual keys, and the sensed movement is sent to a processor which processes and interprets the "pressing" into the desired characters, instructions, information and data, etc. The input may then be transmitted to a computer, mobile telephone, musical instrument, and the like. The laser and beam-moving apparatus are preferably housed in a unit approximately the same size as a cell phone, or even smaller. The laser and beam-moving apparatus may be provided separately from a cell phone, or may be a built-in unit manufactured integrally with the phone.

The present invention is particularly advantageous for mobile communication devices. A user can carry any conveniently small size cell phone, for example, plus the equivalently-sized laser unit of the invention. If the user wishes to type messages to be sent to the Internet via the cell phone, for example, the user simply generates a large size keyboard with the laser unit and comfortably types the commands and message, without having to grapple with multiple presses of keys or with too small keys, or with lugging a clumsy, large keyboard. The present invention thus enables user-friendly use of cell phones for communication on the Internet. The same holds true for palm-sized computer/calculators or PDAs (personal digital assistants).

The present invention also provides a multilingual keyboard heretofore impossible to achieve in the prior art. Current keyboards generally have at most two languages indicated on the keys, e.g., the local language and English. In the present invention, since the keys are "virtual", any language can be optically formed on the keys of the keyboard, and a suitable linguistic processor can interpret between the keyed-in language and any other language in which it is desired to transmit a message. This enables users of different languages from all over the world to communicate with each other with great ease.

In another aspect of the invention, the user can modify the arrangement, size and shape of the virtual keys. In still another aspect of the invention, a hologramic image of all or part of the virtual keyboard can be employed.

The image of the virtual keyboard can be constructed by means of a monochromatic laser, or a blend of differently colored laser beams, either by using multiple laser sources having different colors and wavelengths, or by using a single laser source and using color and wavelength splitters. Differently polarized light beams can also be used. The keyboard of the present invention can not only be used as the sole data input device, but can also be integrated

with other conventional or non-conventional data input devices.

There is thus provided in accordance with a preferred embodiment of the present invention a data input device including an optically generated image of a data input device, the image including at least one data input zone actuable by an action performed thereon by a user, a sensor operative to sense the action performed on the at least one data input zone, and to generate signals in response to the action, and a processor in communication with the sensor operative to process the signals for performing an operation associated with the at least one data input zone.

In accordance with a preferred embodiment of the present invention a light source is provided which generates a light beam, and beam-moving apparatus is provided which moves the light beam to generate the optically generated image of the data input device.

Further in accordance with a preferred embodiment of the present invention the beam-moving apparatus includes a mirror array arranged to reflect the light beam, and an actuator operatively connected to the mirror array, wherein the actuator moves the mirror array to reflect the light beam to form at least a two-dimensional image of the data input device.

Still further in accordance with a preferred embodiment of the present invention the beam-moving apparatus includes a scanner arranged to scan the light beam, and an actuator operatively connected to the scanner, wherein the actuator moves the scanner to scan the light beam to form at least a two-dimensional image of the data input device.

In accordance with a preferred embodiment of the present invention the data input device includes a key of a keyboard, a keyboard, a mouse with at least one input button or a key of a touch pad.

Further in accordance with a preferred embodiment of the present invention the sensor includes an optical sensor, an acoustic sensor or a movement sensor.

Still further in accordance with a preferred embodiment of the present invention the processor is in electrical communication with an output device, such as a computer, a mobile telephone, a switch or a palm-held computer/calculator.

There is also provided in accordance with a preferred embodiment of the present invention a method for data input including generating an optical image of a data input device, the image including at least one data input zone actuable by an action performed thereon by a user, performing an action on the at least one data input zone, sensing the action performed on the at least one data input zone, generating signals in response to the action, and processing the signals for performing an operation associated with the at least one data input

zone.

In accordance with a preferred embodiment of the present invention the step of generating the optical image includes generating an image of a keyboard and the step of performing an action includes pressing keys of the image of the keyboard.

Further in accordance with a preferred embodiment of the present invention the step of processing the signals causes typing alphanumeric characters on a computer, cell phone, palm-sized computer/calculator or PDA.

Still further in accordance with a preferred embodiment of the present invention the method also includes optically generating an image of characters of a first language on keys of the keyboard, linguistically interpreting between a keyed-in language and another language in which it is desired to transmit a message, and transmitting a message in the other language.

In accordance with a preferred embodiment of the present invention the method further includes modifying the image of the keyboard so as to modify a configuration of keys of the keyboard.

Further in accordance with a preferred embodiment of the present invention the optical image of the data input device is a holographic image.

Still further in accordance with a preferred embodiment of the present invention the optical image of the data input device is generated by means of a monochromatic laser.

Additionally in accordance with a preferred embodiment of the present invention the optical image of the data input device is generated by means of multiple laser sources having different colors and wavelengths.

In accordance with a preferred embodiment of the present invention the optical image of the data input device is generated by means of a single laser source and using color and wavelength splitters to split light from the single laser source.

Further in accordance with a preferred embodiment of the present invention the optical image of the data input device is generated by means of differently polarized light beams.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is a simplified pictorial illustration of a data input device constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 2 is a simplified block diagram of the data input device of Fig. 1;

Figs. 3A-3E are simplified pictorial illustrations of optically generated images of data input devices, constructed and operative in accordance with different preferred embodiments

of the present invention;

Fig. 4A is a simplified pictorial illustration of beam-moving apparatus constructed and operative in accordance with a preferred embodiment of the present invention, including a mirror array with servomotors for moving the array;

Fig. 4B is a simplified pictorial illustration of beam-moving apparatus constructed and operative in accordance with another preferred embodiment of the present invention, including a crystal beam modifier;

Fig. 4C is a simplified pictorial illustration of beam-moving apparatus constructed and operative in accordance with yet another preferred embodiment of the present invention, including a scanner;

Fig. 5 is a simplified pictorial illustration of a data input device constructed and operative in accordance with another preferred embodiment of the present invention, including a light unit that projects an optical image of a data input device by projecting light from underneath a transparent or translucent substrate;

Fig. 6 is a simplified illustration of a multilingual keyboard, constructed and operative in accordance with a preferred embodiment of the present invention; and

Fig. 7 is a simplified illustration of a non-standard layout of keys on an optically generated image of a keyboard, wherein a user can modify the arrangement, size and shape of the "virtual" keys, in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Reference is now made to Figs. 1 and 2 which illustrate a data input device 10 constructed and operative in accordance with a preferred embodiment of the present invention.

Data input device 10 preferably includes a light source 12 which generates a light beam 14. In accordance with one preferred embodiment of the present invention, light source 12 is a single laser source, such as a monochromatic laser. Color and wavelength splitters 15 may be provided to split light from the single laser source. Alternatively, multiple laser sources 12 having different colors and wavelengths, may be employed. Additionally or alternatively, light source 12 may generate differently polarized light beams.

Beam-moving apparatus 16, described more in detail hereinbelow, is preferably arranged with respect to light source 12 such that it moves light beam 14 to generate an optically generated image 18 of a data input device. Image 18 of the data input device preferably includes one or more data input zones 19 actuable by an action performed thereon by a user, as will be readily understood by examples of images 18 shown in Figs. 3A-3E. In

Fig. 3A, an image of a keyboard 20 with keys 22 is generated. Keys 22 are the data input zones, and a user "presses" keys 22 to input data. The manner in which the pressing is detected is described hereinbelow. Image 18 may include not only the silhouette of keys 22 but also alphanumeric characters 23 formed in the outline of each key 22.

Fig. 3B illustrates another example of an optically generated input device, that of a mouse 24, wherein pressing or touching an outlined area of a button 26 performs a "click". Alternatively, moving a user's finger in the outlined area can also perform a function. Another example, shown in Fig. 3C, includes an optically generated image of a musical instrument 28, such as an organ with keys 30, wherein "pressing" keys 30 can generate musical notes.

In Fig. 3D, an optically generated image of a touch pad 32, such as for a telephone, is provided with pad keys 34, wherein "pressing" one of keys 34 can generate alphanumeric characters. In Fig. 3E, an optically generated image of palm-held computer/calculator (or any other kind of PDA) 36 is provided with keys or buttons 38, wherein "pressing" one of keys or buttons 38 can generate mathematical functions or alphanumeric characters. The pad keys 34 or keys 38 are also examples of "virtual' PDA switches that can be optically generated. Of course, any kind of switch can be optically generated, such as single-pole and multi-pole switches, for example.

A sensor is preferably provided to sense the above described actions performed on the data input zone 19. Many kinds of sensors can be employed to detect pressing any of the "virtual" keys of the embodiments shown in Figs. 3A-3E. For example, as seen in Fig. 1, the sensor may be an optical sensor 40, such as an electronic camera, whose field of view encompasses the "virtual" keyboard or touch pad, etc. Other examples of suitable sensors include an acoustic sensor 42 and a position or movement sensor 44. Any number of sensors can be used, and more than one kind of sensor can be employed.

The sensors, upon sensing the "pressing" or "striking" of the "virtual" keys, preferably generate electrical signals based upon the sensed information and transmit them to a processor 50 which processes and interprets the signals into the desired characters, instructions, information and data, input by the user. Processor 50 is preferably in electrical communication with an output device, such as a computer 52, mobile telephone 54, musical instrument 56, palm-held computer/calculator 58, and the like, which visually or audibly output the desired characters, instructions, information and data.

In accordance with a preferred embodiment of the present invention, as shown in Fig. 4A, beam-moving apparatus 16 includes a mirror array 60 arranged to reflect light beam 14,

and an actuator, such as a servomotor 62, operatively connected to mirror array 60. Servomotor 62 preferably rapidly moves mirror array 60 to reflect light beam 14 to form a two-dimensional or three-dimensional image of data input device 10. Another example is shown in Fig. 4B, wherein beam-moving apparatus 16 includes a crystal beam modifier 64. Fig. 4C illustrates yet another example of beam-moving apparatus 16, that of a scanner 66. In all cases, light beam 14 is rapidly moved to form a two-dimensional or three-dimensional image of data input device 10. Alternatively, a holographic image of data input device 10 can be produced by holographic equipment 65 (Fig. 2). As another alternative, an image of data input device 10 can be produced by a grating 67 (Fig. 2).

Light source 12 and beam-moving apparatus 16 are preferably housed in a laser unit 68 (Fig. 1) approximately the same size as a cell phone. This makes the present invention particularly advantageous for mobile communication devices. For example, a user can carry any conveniently small size cell phone, for example, plus the equivalently-sized laser unit 68. If the user wishes to type messages to be sent to the Internet via the cell phone, for example, the user simply generates a large size keyboard with laser unit 68 and comfortably types the commands and message, without having to grapple with multiple presses of keys or with too small keys, or with lugging a clumsy, large keyboard. The present invention thus enables user-friendly use of cell phones for communication on the Internet. The same holds true for palm-sized computer/calculators, and other small data input devices. It is noted that the data input devices 10 of the present invention can not only be used as the sole data input device, but can also be integrated with other conventional or non-conventional data input devices.

Although the above described laser unit 68 is considered the most preferred embodiment, nevertheless other light units can be used to generate the optical image of the data input device. For example, as shown in Fig. 5, a light unit 70 may project an optical image 72 of a data input device 74, such as a keyboard, by projecting light from underneath a transparent or translucent substrate 76. A reticle 71 may be provided with a template of the keyboard for producing the image, for example. The sensing of "pressing" the keys of the keyboard and processing signals generated by the sensor is preferably as described hereinabove.

Reference is now made to Fig. 6 which illustrates a multilingual keyboard 80, constructed and operative in accordance with a preferred embodiment of the present invention. Keyboard 80 is preferably formed by laser unit 68, described hereinabove. Laser unit 68 preferably forms a silhouette of keys 82 with alphanumeric characters 84 formed in the outline of each key 82. In the embodiment of Fig. 6, a linguistic processor 86 is in

electrical communication with laser unit 68. Linguistic processor 86 is operative to form an optical image of letters of any alphabet, as chosen by the user.

The user can choose the particular language in a number of ways. For example, as shown in Fig. 6, laser unit 68 can first display a standard "qwertyuiop" layout of keys 82 in English. The user can then type in English the desired language, other than English, and laser unit 68 promptly generates a different set of keys 88 configured to the chosen language. Additionally or alternatively, switches 90 may be provided for switching between languages. It is important to note that the different set of keys 88 does not necessarily have the same amount or layout as the standard "qwertyuiop" layout of keys 82 in English. Linguistic processor 86 is operative to interpret between the keyed-in language and any other language in which it is desired to transmit a message. For example, a Japanese user interested in a website of a Hungarian company, can command laser unit 68 to generate an optical image of a Japanese keyboard, and type a message in Japanese. Linguistic processor 86 then translates the Japanese message into Hungarian, and directs the translated message to the website.

It is noted that linguistic processor 86 may be locally connected to data input device 10, and may be part of its hardware. Alternatively, linguistic processor 86 can be provided on a remote server, such as in the Internet, and remotely accessed. The latter feature enables having an international linguistic interface for global communication.

Reference is now made to Fig. 7 which illustrates that laser unit 68 can display a non-standard layout of keys 92. In accordance with a preferred embodiment of the present invention, the user can modify the arrangement, size and shape of keys 92, such as by typing in commands which are interpreted and processed by processor 50 to generate the desired arrangement. Additionally or alternatively, switches 94 or other hardware may be provided for selecting an arrangement of keys 92.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.

CLAIMS

What is claimed is:

1. A data input device comprising:

an optically generated image of a data input device, said image comprising at least one data input zone actuable by an action performed thereon by a user;

a sensor operative to sense the action performed on said at least one data input zone, and to generate signals in response to said action; and

a processor in communication with said sensor operative to process said signals for performing an operation associated with said at least one data input zone.

2. The device according to claim 1 and further comprising a light source which generates a light beam, and beam-moving apparatus which moves said light beam to generate said optically generated image of said data input device.

3. The device according to claim 2 wherein said beam-moving apparatus comprises a mirror array arranged to reflect said light beam, and an actuator operatively connected to said mirror array, wherein said actuator moves said mirror array to reflect said light beam to form at least a two-dimensional image of said data input device.

4. The device according to claim 2 wherein said beam-moving apparatus comprises a scanner arranged to scan said light beam, and an actuator operatively connected to said scanner, wherein said actuator moves said scanner to scan said light beam to form at least a two-dimensional image of said data input device.

5. The device according to any of the preceding claims wherein said data input device comprises a key of a keyboard.

6. The device according to any of claims 1-4 wherein said data input device comprises a keyboard.

7. The device according to any of claims 1-4 wherein said data input device comprises a mouse with at least one input button.

8. The device according to any of claims 1-4 wherein said data input device comprises a key of a touch pad.

9. The device according to any of the preceding claims wherein said sensor comprises an optical sensor.

10. The device according to any of the preceding claims wherein said sensor comprises an acoustic sensor.

11. The device according to any of the preceding claims wherein said sensor comprises a movement sensor.

12. The device according to any of the preceding claims 1-11 wherein said processor is in electrical communication with an output device.

13. The device according to claim 12 wherein said output device comprises at least one of a computer, a mobile telephone, a switch, and a palm-held computer/calculator.

14. A method for data input comprising:

generating an optical image of a data input device, said image comprising at least one data input zone actuable by an action performed thereon by a user;

performing an action on said at least one data input zone;

sensing the action performed on said at least one data input zone;

generating signals in response to said action; and

processing said signals for performing an operation associated with said at least one data input zone.

15. The method according to claim 14 wherein the step of generating the optical image comprises generating an image of a keyboard and the step of performing an action comprises pressing keys of said image of said keyboard.

16. The method according to claim 15 wherein the step of processing said signals causes typing alphanumeric characters on at least one of a computer, cell phone, palm-sized computer/calculator and PDA.

17. The method according to claim 15 and further comprising optically generating an image of characters of a first language on keys of said keyboard, linguistically interpreting between a keyed-in language and another language in which it is desired to transmit a message, and transmitting a message in said other language.

18. The method according to claim 15 and further comprising modifying said image of said keyboard so as to modify a configuration of keys of said keyboard.

19. The method according to claim 14 wherein said optical image of said data input device is a holographic image.

20. The method according to claim 14 wherein said optical image of said data input device is generated by means of a monochromatic laser.

21. The method according to claim 14 wherein said optical image of said data input device is generated by means of multiple laser sources having different colors and wavelengths.

22. The method according to claim 14 wherein said optical image of said data input device is generated by means of a single laser source and using color and wavelength splitters to split light from said single laser source.

23. The method according to claim 14 wherein said optical image of said data input device

is generated by means of differently polarized light beams.

24. The device according to any of claims 1-14 and substantially as described hereinabove.

25. The method according to any of claims 14-23 and substantially as described hereinabove.

For the Applicant,

Sanford T. Colb & Co.
Advocates & Patent Attorneys
C:38068

FIG. 1

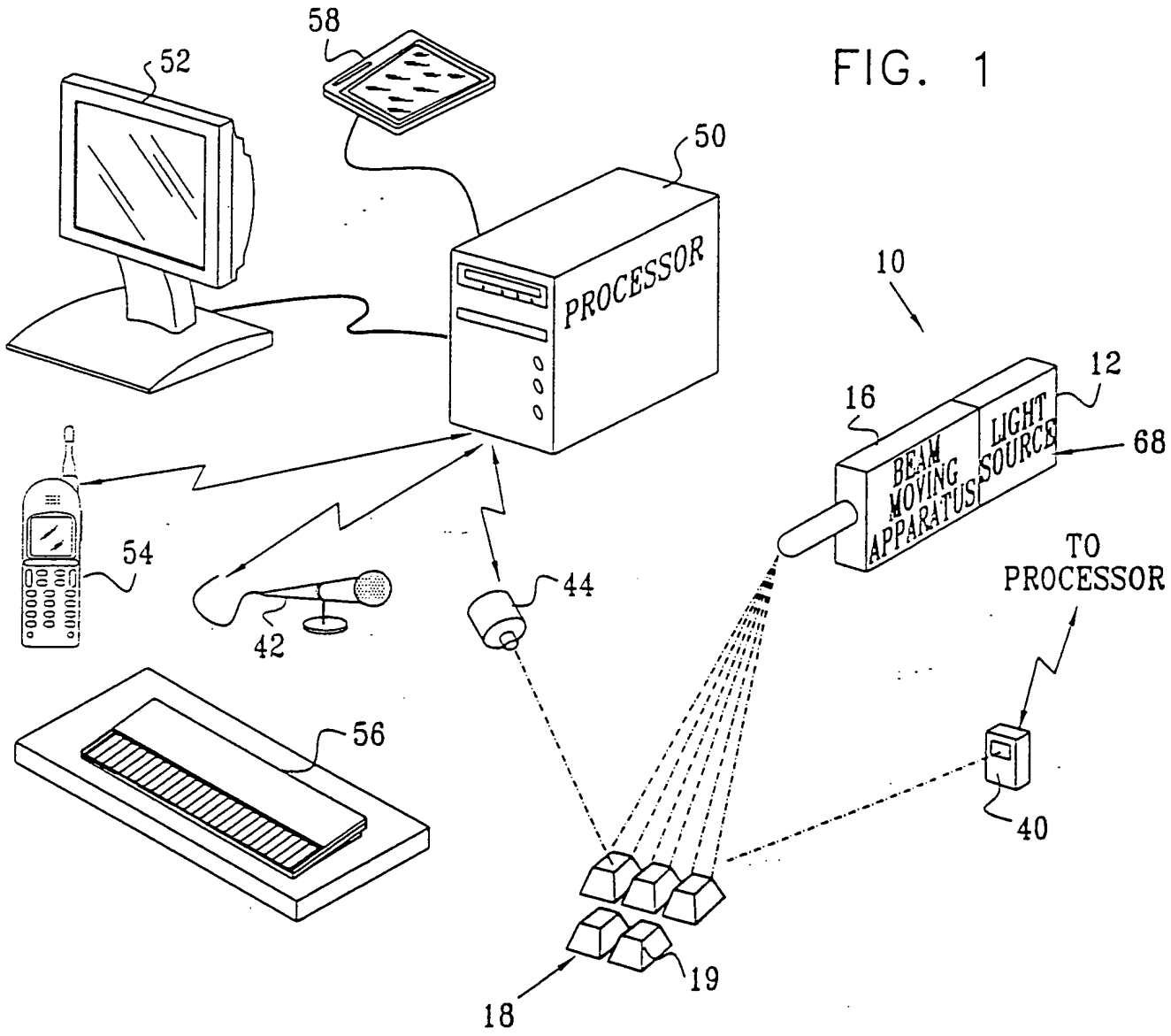
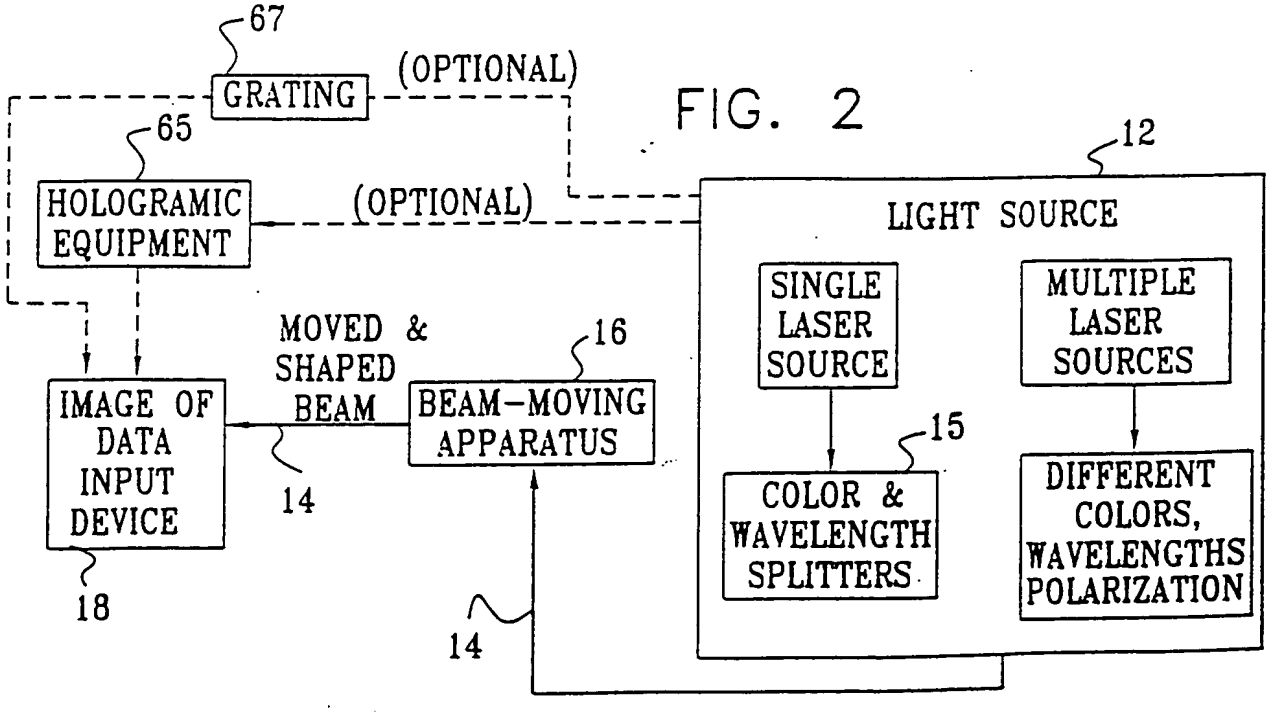

58
52
50
PROCESSOR
10
12
16
LIGHT SOURCE
BEAM MOVING APPARATUS
68
54
42
44
TO PROCESSOR
56
40
19
18

FIG. 2


67
GRATING
(OPTIONAL)
65
HOLOGRAMIC EQUIPMENT
(OPTIONAL)
12
LIGHT SOURCE
SINGLE LASER SOURCE
MULTIPLE LASER SOURCES
MOVED & SHAPED BEAM
16
IMAGE OF DATA INPUT DEVICE
BEAM-MOVING APPARATUS
15
COLOR & WAVELENGTH SPLITTERS
DIFFERENT COLORS, WAVELENGTHS POLARIZATION
14
18
14

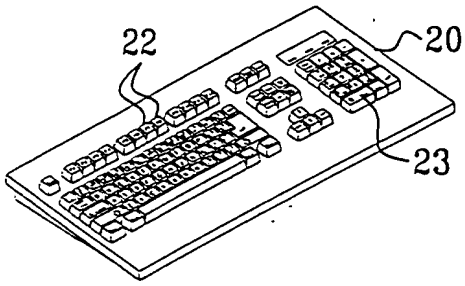


FIG. 3A

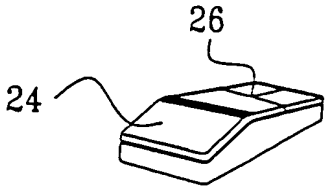


FIG. 3B

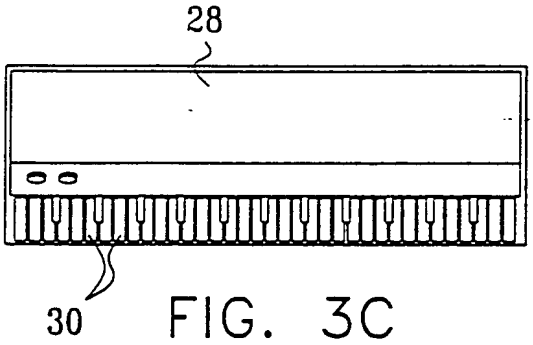


FIG. 3C

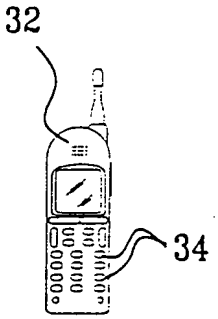


FIG. 3D

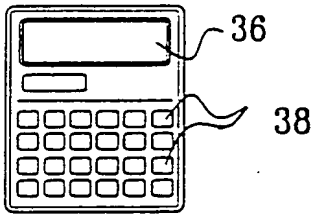


FIG. 3E

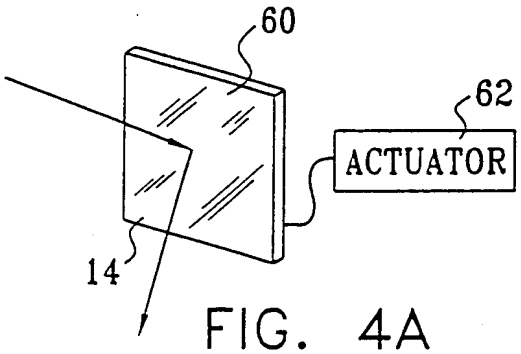


FIG. 4A

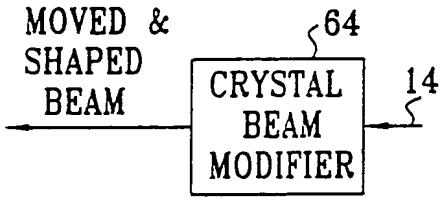


FIG. 4B

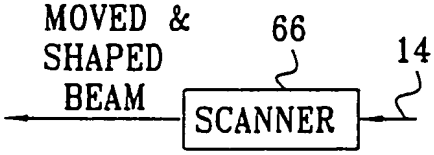


FIG. 4C

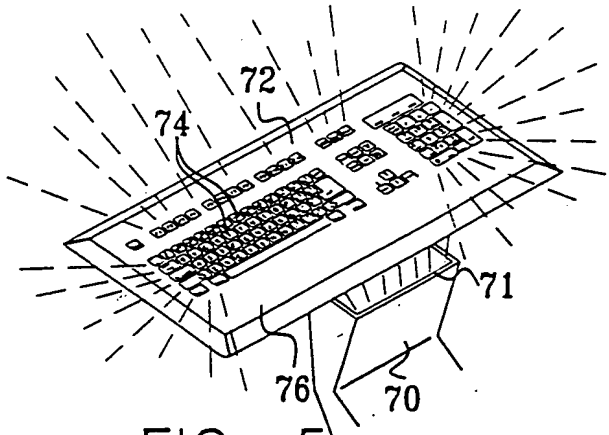


FIG. 5

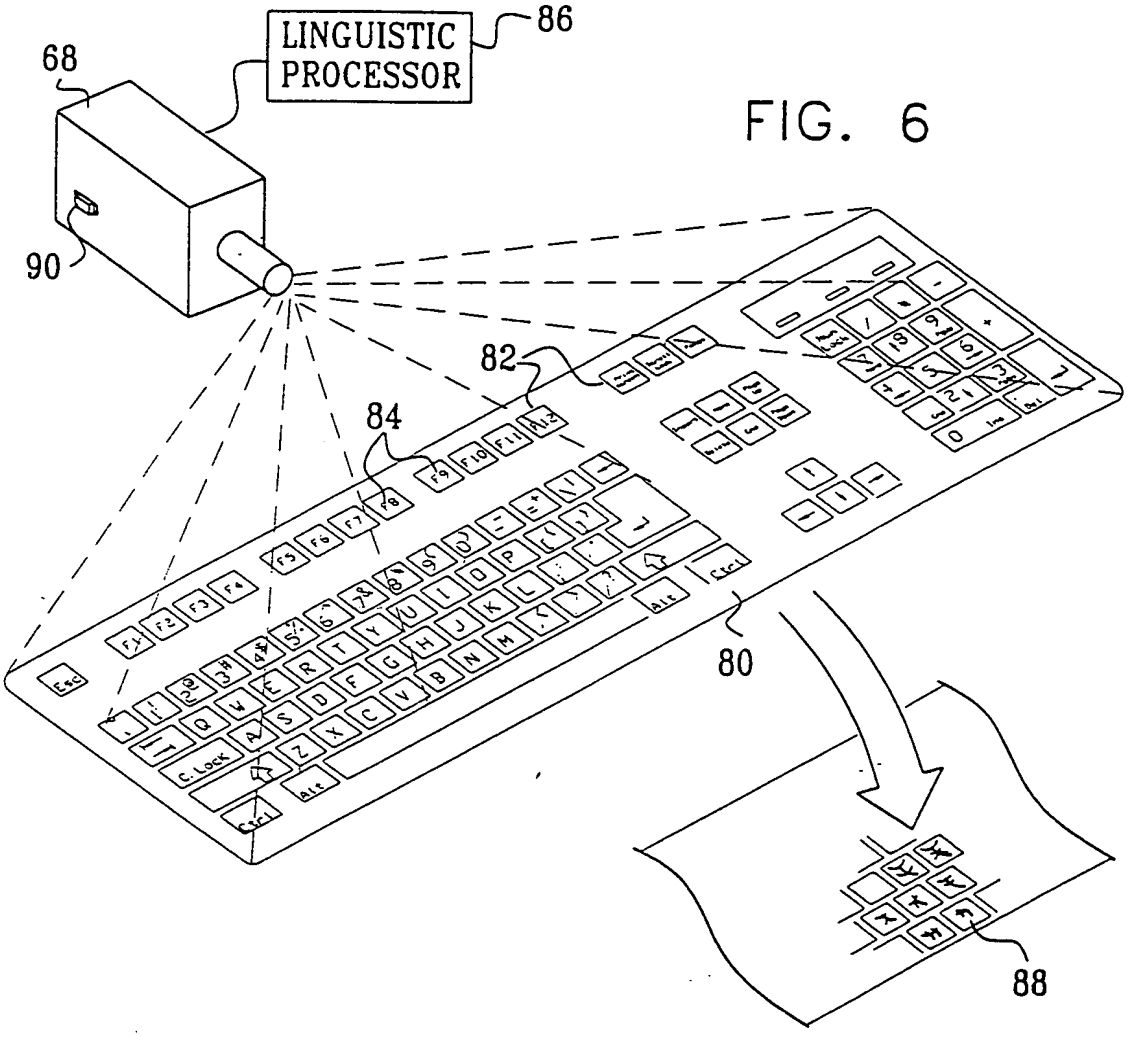


FIG. 6

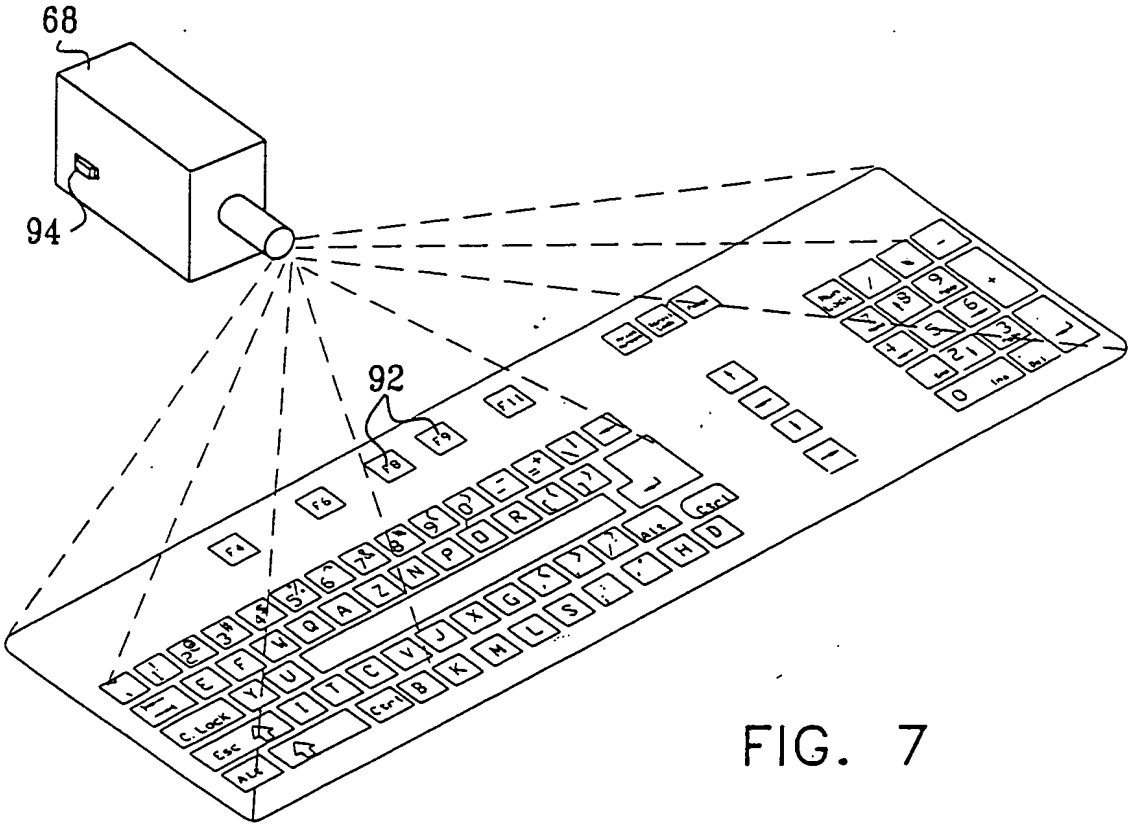


FIG. 7